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ABSTRACT

The process of studying different orientations to teaching introductory biology through interviews designed to elicit teachers' beliefs was analyzed. College teaching assistants were questioned about their beliefs. Interviews were analyzed in terms of teaching, learning, curriculum, and "governance." Each teacher identified most strongly as student, teacher, or researcher; and the role most strongly felt had a pervasive influence over many of their conceptions. The approaches of the two researchers and their reactions were detailed, not to generalize about the beliefs held, but to provide a way to make interview data more meaningful. The analysis eventually will be tested by determining how it can help pre-service teachers become more aware of issues in their own education. (SLD)

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EFFECTS OF RESEARCH PERSPECTIVE

ON

ANALYSIS AND PRESENTATION OF INTERVIEWS

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INTRODUCTION TO THE STUDY - TRUMBULL

In the spring of 1987 I started a research project. The first phase involved using interviews to elicit and examine the assumptions/beliefs/constructs about teaching introductory college biology held by teaching assistants in an introductory course. I am interested, ultimately, in the pre-service education of biology teachers and in the development of biology curricula. I wanted to learn about the teaching assistants' views because the way university introductory biology is structured seems to influence, in numerous ways, peoples' concepts of what introductory biology in high school should be. I interviewed TAs who volunteered for the study. Also, I had worked as a TA in the same course some years earlier, and felt that my views on teaching biology had been affected by my work in the course.

I started my research hoping to develop typologies of views about introductory biology teaching. I thought that perhaps I would be able to use at least some of the dilemmas identified by Ann and Harold Berlak for examining different aspects of education, but realized that other ways of characterizing differences among TAs would become apparent in the process of analysis.

I had a grant that would pay a research assistant, and I wondered best how to use one. I had not worked with a research assistant before on a qualitative study. I was fortunate to find a graduate student who was finishing the data gathering phase of her desertion research, and beginning the analysis.

I decided that the best way to work with Pat would be to do parallel processing of an initial sample of interviews. Pat had read my proposal, so knew somewhat what I wanted to do and knew also how open-ended the analysis phase was. I expected that the contrasts of our analyses would help to enrich the category system we would develop. As Glaser and Strauss indicated:

> The constant comparative method is not designed (as methods of quantitative analysis are) to guarantee that two analysts working independently with the same data will achieve the same results. (p. 103)

I came up with the following scheme; each one of us would read an interview, and each one would prepare some kind of prose summary of the interview. We would meet and compare our summaries. We would not really discuss how we chose to characterize the views of these people but in our discussions and work the categories we used to make distinctions would come clear. I figured that after working through the four interviews we would eventually be able to develop some scheme that would allow us to prepare a profile of each one, some set of dimensions or axes along which we could

place each person. I have found much of the qualitative methodological work I have read to be less than helpful for guiding actual studies and hoped to produce a natural history of the process of category determination. I thought it would be possible to illustrate how some of this work actually got done.

Glaser and Strauss write, "In discovering theory, one generates conceptual categories or their properties from evidence; then the evidence from which the category emerged is used to illustrate the concept" (p. 23). I began reading interview transcripts and attempting to generate category systems that would help to describe and differentiate the interviewees.

As I began the work, I assumed that the problem would be one of justifying inferences or interpretations made. I assumed that categories would "emerge," and that we would us them to discriminate among the four interviewees. My expectation was that we would justify our characterizations of these people by referring to specific quotes. As we presented our cases to each other, the details of the different categories would emerge.

I expected that we would interpret people's quotes somewhat differently, especially because we each knew one of the interviewee's in a different context. Pat had taken courses with one TA, I had worked with another TA in an independent study the semester before. I expected that Pat and I would therefore be able to pull in other evidence to support our interpretations of the interviews and was interested in looking at what kinds of additional evidence would be useful. This process would also allow us to evaluate the effectiveness of an interview-based study in meeting the goals I had set, determining different orientations to teaching intro biology.

ONE ANALYSIS PROCESS - KERR

I entered this project with a minimum of prior knowledge about the research. I had not constructed the questions, interviewed the participants, or listened to the tapes. I knew, from conversations with Deb, and from reading the original research proposal, that one of the goals of this research was to determine what beliefs certain practitioners had about introductory biology courses. Research has shown that these belief systems, in some ways, shape practice. The interview questions were designed to elicit those beliefs. One of the assumptions of this study is that the interviews are a record of the practitioner's beliefs about introductory biology. Another is that it is possible to transform the data into knowledge claims about belief systems, and interpret from those claims how teaching practice is formed, changed or influenced by those beliefs.

I had little knowledge of what "counted" as evidence in determining these beliefs. The direction and formulation of the research was Deb's, and my "job" was to help make sense out of the interviews. Specifically, I was to determine what the interviewees believed were the major concepts, goals, and outcomes of the introductory biology course, and how those beliefs

shaped their practice as teaching assistants. My first encounter with the data was reading the typed transcripts of the interviews.

My experience with interview data from my own research was to analyze it according to the conceptual propositions that guided the development of the interview questions. Then that analysis, again on a conceptual basis, formed the framework for the narrative I was writing. I use concept propositions and concept mapping for the analysis and as a guide to the writing, including direct quotes for support of propositions from which I interpreted meanings. I decided to approach these interview data in the same way.

My initial step was to take each question and answer as a unit and try to identify the concepts from each of those units. I wrote these "units" in outline form, and at the same time, wrote conceptual proposition statements and constructed concept maps from each of the units. Reflecting on these about halfway through the first interview, I realized that I could use the four commonplaces, identified by Joseph Schwab as central to any educating event, as a framework to "hang" the concepts on. The commonplaces are teaching, learning, curriculum and social milieu. I substituted governance for social milieu, a term used by Gowin (1981). My idea was to write what each participant said about educating in an introductory biology course in terms of their teaching, their students' learning, the curriculum they had been given, and the governance that controlled the meaning of this course at the University.

The TAs answered the questions in terms of their actual experience. They also expressed feelings when they talked about (or were asked) what was good or not-so-good about those experiences. To me, the statements that combined thinking and acting <u>with</u> feeling were the most indicative of their beliefs about the systems they were describing, and the most powerful. I agree with the notion that thinking, feeling and acting are combined in any act of learning.

To construct the knowledge about this event--the interviews of the TAs--I started with the focus question (What are the beliefs of TAs in an introductory biology course?), the record (typed transcript) and the concepts, both derived and explicit that I had identified from the questions and answers. I used the concepts to formulate principles for "making meaning" or interpreting the interviews. I would use direct quotes from the participants to illustrate these meanings in construction of the narrative. By working back and forth between these epistemic elements it would be possible to construct some knowledge claims about the beliefs these teachers held about an introductory biology course.

Deb had talked about developing categories for analysis. We had not tried to establish what those categories were or even what criteria should be used to identify them. Because I am familiar with concepts, I decided to stay with that analysis, hoping that categories, if indeed they are desired outcomes, would emerge.

Because my own research is gender related, I am aware of attempts to identify and formulate a feminist epistemology. Sandra Harding in Feminism and Methodology, (1987) suggests three features (out of others) that help account for the "distinctive power" of feminist research. Two of these three features add to my perspective in this analysis attempt. First, the recognition of women's experience as an empirical and theoretical resource.

> Critics argue that traditional social science has begun its analyses only in men's experiences. That is, it has asked only the questions about social life that appear problematic from within the social experiences that are characteristic for men. (Harding, 1987, p. 6)

In other words, "many phenomena which appear problematic from the perspective of men's characteristic experiences do not appear problematic at all from the perspective of women's experiences" (Harding, 1987, p. 6). The reverse is also true.

EDDIE AS ANALYZED BY KERR

I have a strong commitment to recognizing experience as critical in forming beliefs about teaching and learning. During the discussion of our analyses of Eddie's interview data, Deb noticed how strongly he identified as a student. To me, this statement was a clue for typifying the TAs. Eddie had been an undergraduate at Cornell before his teaching experience in an inner city school, and had returned to complete his doctoral work at Cornell. How much had those experiences influenced what he was claiming about this introductory course? His comments about teaching and learning had meaning when interpreted in light of those experiences, particularly his strong identification as a student.

The second feature of feminist research Harding describes "insists that the inquirer her himself be placed in the same critical plane as the overt subject matter, thereby recovering the entire research process for scrutiny in the results of research." (Harding 1987, p. 9) That means that I, the researcher/analyzer, "with my class, race, culture, gender assumptions, beliefs and behaviors must be placed within the frame of the picture that I attempt to paint." (Harding, 1987, p.9) I bring into this research relevant experience as a high school biology teacher, as a TA in a non-major's biology course, and as a woman in science. In the November 11 analysis session I commented,

> First of all our epistemological stance is going to enter into that, our view of the world, our view of learning and teaching, and whether or not these TAs fit or don't fit into our view as we interpret it. That's all a part of it. We're not standing aside from this whole process. +++ I can't divorce my feelings about learning and teaching and affect in the classroom from what they said and not be critical or supportive. (page 1, Pat & Deb discussion, 11/11/88) (++++ refers to deleted material)

To illustrate this second feature: at one point, I defend Eddie because he is doing the best he can with the curriculum assigned to him. Deb adds "and the knowledge he has about teaching." (1st P & D discussion, p. 13) I am thinking more of practice, experience of that classroom. I accepted the notion that his beliefs about biology came from his experiences in teaching and learning. But his actions were determined by the curriculum and governance of the course.

Later, I write that I am sympathetic with Eddie. He left teaching because

> intellectually, I learned all I was going to learn. +++ The high school stresses are ridiculous+++ my experiences there led me in the end to ultimately believe that not only is it not good for me but that you can't like, fight with the system for so long. You just, you know, you'll just tear yourself up." (Eddie I, p. 2)

I identified with this discomfort, this dilemma. For Eddie, that lack of intellectual growth was not because he had become an "expert" and could go no further, but that teaching was no longer intellectually challenging for him. He did not have the experience or encouragement to further explore his subject field as a way to continued growth in teaching. I say in the Nov. 11 discussion, "I think he represents a symptom of teaching that isn't just isolated to inner city schools. And that is "I've learned all I could learn and I wasn't intellectually stimulated," and yet he has a very limited knowledge of what he was doing and what he was teaching and what the structure of biology and science really is. I think having that knowledge before you go into a teaching situation means that it never becomes intellectually dead because there is a constant way in which you are involved in it; in depicting the structure of that knowledge and sharing that with the students." (P & D I, p. 2)

Now, (March 1988) as I reflect on his comments about that inner city teaching experience and other comments about his "helplessness" in the biology course as a TA, I think of Eddie as in conflict, much as the way women scientists can be in conflict within the social contexts and belief systems in which science is practiced, or as science teachers can be, with a governance system and curriculum that does not allow elements of experience to "count" in teaching practice.

These two features together, the validity of (women's) experience as an epistemic element, and the researcher/researched integration, alter my approach to the material for analysis. The perspectives, experiences and beliefs of my own have influenced my analysis and interpretation of the data.

To summarize, I approached this analysis with prior knowledge; of the nature of the research, of the interview questions, my own experience as a teacher, a woman, and researcher; extracted concepts and concept proposition, knowledge claims and finally interpretation. The only "concrete" categories I started with was their "role" models, (teacher, researcher, student), suggested by Deb, and the four commonplaces.

What should be clear to the reader is the bases for my interpretations of the interviews. I am interpreting their "answers" within the framework of my view of educating, epistemology and experience in gender research. This will affect the meaning I derive from the transcripts. Any interpretation is a composite of the interview, the questions asked, the interviewer, the interviewee and the interpreters. That theoretical framework must be offered along with the interpretation because the meaning is derived from that. This "framework" is frequently missing from research that attempts to ascribe meaning to an educational event. This paper is about method. But method is only one of the epistemological elements in a research endeavor.

ONE ANALYSIS PROCESS - TRUMBULL

I began my analysis by reading through the transcripts of all four of the TA's we were going to compare. I had a list of the areas about which I wished to identify beliefs. I thought that I would be able to make clear determinations about what TA's felt the purpose of introductory biology should be, what the curriculum of the course should be, how it should be taught, and what the purpose of lab was. I knew that these broad categories would evolve and change as I compared the responses of the four. I did not begin analysis until I had read all four transcripts. I felt that the distinctions between people would help me to develop categories and I tried to keep a record of this process. When Pat and I met to compare analyses, we focused on one TA each time and taped our conversations.

As I examined the tapes of the discussions Pat and I had, I was struck by how subtlety the evolution of our characterizations occurred. We attempted to keep very careful records documenting the development of categories. Sometimes, though, our conversations seem impenetrable to me now. It is not always clear how we thought out our judgement. One example is the use of role identification to separate the TA's.

It seems that each TA had a role with which they identified most strongly, student, teacher, or researcher, and that this role had pervasive influence on a number of the conceptions they held. The use of role identification as an organizing theme for analysis developed slowly. It was something I mentioned first in an early analysis session, and only in passing. We kicked the idea around, then moved on. Pat picked up on it, and used it as a way to focus a prose piece she wrote for the next analysis. She used it so powerfully, I saw the idea of role identification as a new and powerful heuristic, unaware that I had mentioned it first.

More importantly than recognizing the tacit elements in the development of categories, tho, I began to question my original assumptions about what I was doing in this research. As we compared our initial characterizations and discussed them, we talked through why we had seen someone this way or that way. Our discussions were free-flowing and, I thought, productive. After all the talking, I came up with 9 categories across which to compare TAs: goals of lab, goals of course, structure of biology, conceptions of scientific method, how to teach S.M., definition of

learning, evidences of learning, characterizations of students, role of teacher, problems-solutions-sources.

I was developing categories that would allow comparisons across interviewees so I could make statements such as A thinks that these three concepts are important, B thinks two of those are important but adds two more, etc. C sees grading as a problem but solves is by giving easy quizzes. D does not see grading as a problem and construct quizzes that help provide a good curve. The image that impelled this work was a graphic display that would present the contrasting view of these four people. The clever display would allow a reader to get a quick overview of the similarities and differences of the four.

Vestiges of positivism: By concentrating my energy on the identification of particular categories I lost the interrelationships and ecology of peoples' notions. I've used "qualitative" data to generate counts and correlations and have lost the people holding the ideas; their histories, their contexts, their feelings, their hopes, are all lost. My initial analysis of Eddie indicates what I had done.

EDDIE AS ANALYZED BY TRUMBULL

Eddie sees the goal of the lab as teaching students basic principles of biology, though he cannot really articulate what those are, other than scientific method. The purpose of the entire course is to teach students what they will need to know in later courses, though again Eddie cannot really add any detail to this general statement. Eddie does not seem to have thought much about the structure of the discipline of biology. He assumes that the introductory course as presently structured will cover all the important areas of the discipline by covering a range of topics. He does not question the particular topics included in the course.

He sees the scientific method as a clearly delineated process, composed of separate steps. To teach this scientific method to students, each step should be taught in isolation. When students have mastered all the individual aspects of the scientific method, they should do a project that requires them to combine all the individual steps into a complete investigation.

Eddie makes no distinction between memorizing and learning for a deeper understanding. He says he knows students are confused when they come to him for extra help outside class time. Also, he can watch them in lab and see when they are not learning. He assumes that, overall, students must be learning the material because they have to to pass the tests. He sees students as having a great deal of work to do and very pressured by the demands of introductory courses in the sciences.

When Eddie talks about non-favorite students he refers to students who challenge TAs, though he says he has not had any bad experiences himself. He sees the teacher as the expert who can answer all student questions. The problems he identifies in the course relate to the amount of work required of students, having to curve grades which results in some of his students getting low grades, even though they are not stupid.

DISCUSSION OF DIFFERENCES

We agree substantively on Eddie's perception of biology and teaching and learning. Our hypotheses about his actual teaching practices were also similar. Because we had only interview data, we could not test these hypotheses. We found, with some of the other interviews, that we did differ in our hypotheses about teaching practices. These disagreements indicate the limits of the usefulness of interview data for characterizing the teaching perspectives of these people fully. We were able to reach general agreement about constructs used in talk about teaching, not unimportant, but not a full view of the person as teacher.

We agreed on the importance of his "role" as a student. However, in terms of the research question, Deb has a much better notion of which of Eddie's statements portray assumptions he holds about the initial issues. Given that set of statements, she can examine those assumptions more critically. Clearly, that is a valuable perspective to hold when using interview data and direct quotes as a source for justifying those assumptions.

Pat did not approach the data looking for evidence to support attributions about the beliefs Eddie had, although Pat kept some concern for understanding his individual beliefs in mind. Pat did not follow through on the identification and justification single mindedly. Pat ended up looking for the entire person and his/her position in the context of the classroom; a classroom that includes teacher, learner, curriculum and governance. Pat feels more unsure of critically examining his assumptions from her position. She chose, rather, to give a broader explanation for his position.

The differences in the initial analyses are consonant with a constructivist approach to answering problems. A researcher has a problem, a collection of data that make a "messy" and unclear text. Two people attempting to solve that problem presented by the same "hard" evidence may come up with similar answers but couched in very different frameworks. The two conceptual networks leading to that answer are unique to each person. Deb and Pat essentially agreed on Eddie's beliefs. However, Pat presented them in a way that helped to make clear the development of these ideas, their relationships, and their interactions. Deb's initial categorization presented his notions separated from each other and from his particular biography.

Pat's narrative permits more of Eddie the person to remain. By creating a narrative, Pat kept our attention focused on the factors that may have contributed to Eddie's development. Ultimately, we have worked with a combination of our analyses. The categories Trumbull pulled out are useful. The narrative focus Pat used helps keep these categories in context and helps to think of more ways to plan educational projects for people like those interviewed. The combination of approaches allows a hermeneutical process to continue and not be sacrificed in the search for categories. Trumbull remains abashed to realize the degree to which residual positivist assumptions directed her initial analyses. By focusing on categories she ignored the relevant contextual details that make a hermeneutic process

possible. We would argue that qualitative research should be distinguished by its commitment to an interpretive process that always attends to contexts.

The attempt of this exercise was not to generalize from the range of the beliefs held by this small sample, but to provide a useful way of making interview data meaningful. The next step in the research is to determine the extent to which one can make use of the analysis in interpreting the next set of interviews. From there, the analysis will be tested by determining how it can help pre-service teachers explore and become aware of these issues in their own education: issues we can all recognize as pre-suppositions for the assumptions that guide our practice of teaching.

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